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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,644	01/16/2002	Min Li	HT01-022	5984

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EXAMINER

OLTMANS, ANDREW L

ART UNIT	PAPER NUMBER
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1742

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DATE MAILED: 10/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/050,644

Applicant(s)

LI ET AL.

Examiner

Andrew L Oltmans

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-83 is/are pending in the application.
- 4a) Of the above claim(s) 45-83 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-83 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 1742

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-44 in Paper No. 4 is acknowledged. The traversal is on the ground(s) that the fields of search for Group I and Group II are coextensive, and therefore there is no undue burden place upon the examiner in examining both the method and apparatus claims. This is not found persuasive because the examiner maintains that the search performed for Group I and Group II inventions would not require a search in method classes 29 and 148. Therefore, an undue burden would be placed upon the examiner in searching for both inventions.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-44 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. In claim 1 (lines 18-19) and claim 26 (17-18), the claims recite the phrase "a capping layer (NOL) of specularly reflecting material, which renders the claims indefinite. The use of the parenthetical "NOL" renders it unclear whether the claim is requiring the inclusion of NOL (defined in the specification e.g. page 7, line 12) or if the

Art Unit: 1742

NOL is merely an example of the specular material. For the purposes of the prior art rejections below, the meaning of the phrase is being interpreted as being merely an example of a specular material.

b. Claims dependent upon the above are likewise rejected under this statute.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Applicant's Admitted Known Prior Art in view of Pinarbasi 6,268,985

5. Claims 1-17 and 25-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Known Prior Art in view of Pinarbasi 6,268,985 (Pinarbasi).

Applicant admits as prior art, the method of making a bottom spin valve magnetoresistive sensor element wherein the method includes the steps of providing a substrate, forming the magnetoresistive-property-enhancing seed layer, forming the pinning layer of antiferromagnetic material, forming the layer of synthetic antiferromagnetic pinned layer, forming the second antiparallel pinned layer of ferromagnetic material, forming the non-magnetic coupling layer, forming the non-magnetic spacer layer, forming the ferromagnetic free layer and forming a capping layer, wherein the compositions and thickness is encompassed by the compositions and thickness instantly claimed in claims 1-16 and 26-43 (Figure 1a (labeled prior art) and the explanation of Figure 1a on page 8 of the specification). Likewise the applicant admits as prior

Art Unit: 1742

art the annealing steps recited in claim 25, wherein the steps were utilized to form the prior art "standard reference bottom spin valves" given as samples 1 and 3 on page 13 of the specification.

However, the prior art admitted by applicant did not include the specific step of "forming... a double-layer capping layer" having the first and second layers instantly claimed in claims 1 and 26.

Pinarbasi teaches a double-layer capping layer on spin valve magnetoresistive sensors (abstract and col 1, lines 7-14) wherein the capping layer comprises a first layer of non-magnetic material, including ruthenium (col 3, lines 9-10), and wherein the second layer is an specularly reflecting material including nickel oxide, tantalum oxide or aluminum oxide (col 3, lines 11-12), as instantly claimed in claims 1, 17 and 26. Pinarbasi teaches that a capping layer having the two layer structure has the advantages of no stiffening of the magnetic moment of the free layer, especially when the free layer includes a cobalt iron thin film (col 3, lines 16-18).

One of ordinary skill in the art at the time that the invention was made would have found the invention to have been obvious because one of ordinary skill in the art would have been motivated to cap the known prior art spin valve structure (as admitted by applicant) with the double layer capping layer taught by Pinarbasi in order to provide the desirable properties of a spin valve that has no stiffening of the magnetic moment of the free layer, especially when the free layer includes a cobalt iron thin film (Pinarbasi: col 3, lines 16-18).

Art Unit: 1742

Applicant's Admitted Known Prior Art in view of Gill 6,181,534

6. Claims 1-18 and 25-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Known Prior Art in view of Gill 6,181,534 (Gill; cited on IDS filed March 7, 2002).

Applicant admits as prior art, the method of making a bottom spin valve magnetoresitive sensor element wherein the method includes the steps of providing a substrate, forming the magnetoresitive-property-enhancing seed layer, forming the pinning layer of antiferromagnetic material, forming the layer of synthetic antiferromagnetic pinned layer, forming the second antiparallel pinned layer of ferromagnetic material, forming the non-magnetic coupling layer, forming the non-magnetic spacer layer, forming the ferromagnetic free layer and forming a capping layer, wherein the compositions and thickness is encompassed by the compositions and thickness instantly claimed in claims 1-16 and 26-43 (Figure 1a (labeled prior art) and the explanation of Figure 1a on page 8 of the specification). Likewise the applicant admits as prior art the annealing steps recited in claim 25, wherein the steps were utilized to form the prior art "standard reference bottom spin valves" given as samples 1 and 3 on page 13 of the specification.

However, the prior art admitted by applicant did not include the specific step of "forming... a double-layer capping layer" having the first and second layers instantly claimed in claims 1 and 26.

Gill teaches a double-layer capping layer on spin valve magnetoresistive sensors (abstract and col 2, lines 741-63) wherein known capping layers comprise a first layer of non-magnetic material, including copper, silver, gold (col 2, line 50 and col 3, line 9), and wherein the second

Art Unit: 1742

layer is an specularly reflecting material including nickel oxide (col 2, line 58; col 3, line 7), as instantly claimed in claims 1, 17, 18 and 26. Gill teaches that a capping layer having the two-layer structure including NiO is a desirable structure of bottom spin valve sensors (col 2, lines 57-58) and has the advantage of conserving conduction electrons (col 2, lines 51-53).

One of ordinary skill in the art at the time that the invention was made would have found the invention to have been obvious because one of ordinary skill in the art would have been motivated to cap the known prior art spin valve structure (as admitted by applicant) with the double layer capping layer taught by Gill in order to provide the desirable properties of a spin valve that has the advantage of conserving conduction electrons (Gill: col 2, lines 51-53).

Allowable Subject Matter

7. Claims 19-24 and 44 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Art Unit: 1742

a. A primary reason for the allowance of claims 19-24 and 44, under the above conditions, is that the prior art fails to teach or suggest, either alone or in combination, the instantly claimed method wherein the method includes the step of forming the specular reflecting material layer of FeTaO, oxidize Fe or oxidized $(\text{Fe}_{65}\text{Co}_{35})_{97}\text{V}_3$ to the thickness claimed.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew L. Oltmans whose telephone number is 703-308-2594. The examiner can normally be reached 7:00-3:30 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Andrew L. Oltmans
Examiner
Art Unit 1742

September 27, 2003